



SURFACE VEHICLE RECOMMENDED PRACTICE	J3111™	DEC2024
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Brake Rotor Thickness Variation and Lateral Run-Out Measurements		

RATIONALE

Lateral run-out (LRO) and disc thickness variation (DTV) are critical features that influence driver comfort and vehicle braking system performance. The different measurement methods and techniques can generate significantly different results. This SAE Recommended Practice is intended to improve repeatability, reproducibility, and the ability to compare different methods.

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Documents

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1. SCOPE

This SAE Recommended Practice is derived from common methods used within the industry and is not intended to validate a given design or configuration. This SAE Recommended Practice applies to vehicles below 4540 kg of gross vehicle weight rating.

1.1 Purpose

This SAE Recommended Practice includes the main terminology, definitions of terms, common methods, instrumentation, and proper techniques to quantify, filter, and represent the measurement results.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J2521 Inertia Dynamometer Brake Squeal Noise Test Procedure for Vehicles without Regenerative Systems

SAE J3152 Taxonomy and Guidelines for Design, Fabrication, and Installation of Brake NVH Fixtures for Inertia Dynamometer Testing

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO/TR 16610-32 Geometrical product specifications (GPS) — Filtration — Part 32: Robust profile filters: Spline filters

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 16610-21 Geometrical product specifications (GPS) — Filtration — Part 21: Linear profile filters: Gaussian filters

ISO 16610-31 Geometrical product specifications (GPS) — Filtration — Part 31: Robust profile filters: Gaussian regression filters

3. DEFINITIONS

3.1 CAPACITANCE PROBE

A non-contact sensor that uses the magnetic field between two plates (probe and target) to determine the existing air gap (see Appendix A).

3.2 CAPACITANCE PROBE STAND-OFF

The initial distance from the probe to the target. The stand-off should be a function of the type of measurement, probe full scale, probe design, and rotor design.

3.3 CONTACT SENSOR

A precision measuring tool with various tips to accurately measure linear distances.

3.4 DISC THICKNESS VARIATION (DTV)

The thickness variation along one rotor revolution at a constant radius. This is a calculated value; the inboard LRO is subtracted from the outboard LRO to obtain the DTV value for each angular and radial position (see Figure 1).

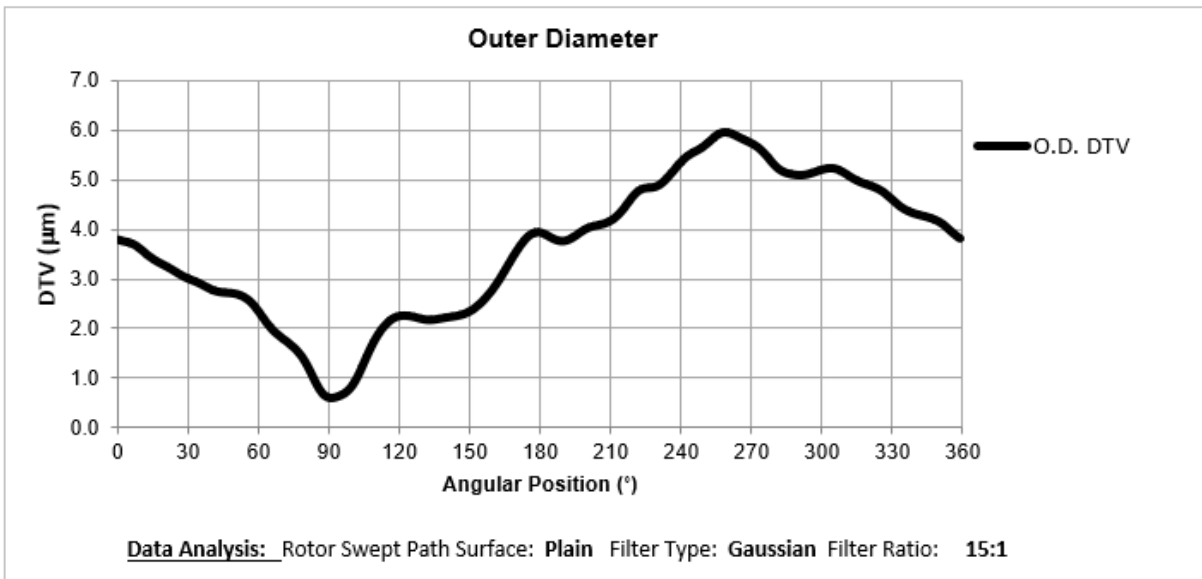


Figure 1 - Sample DTV plot

3.5 DYNAMOMETER DRIVE METHOD

Refer to SAE J2521.

3.6 DYNAMOMETER FIXTURE

Refer to SAE J3152, which outlines the various fixture levels that can affect how the sensors are attached.

3.7 LATERAL RUN-OUT (LRO)

The variation in axial distance to the surface of the rotor during one complete revolution at a specified radius from the center of rotation (see Figure 2).

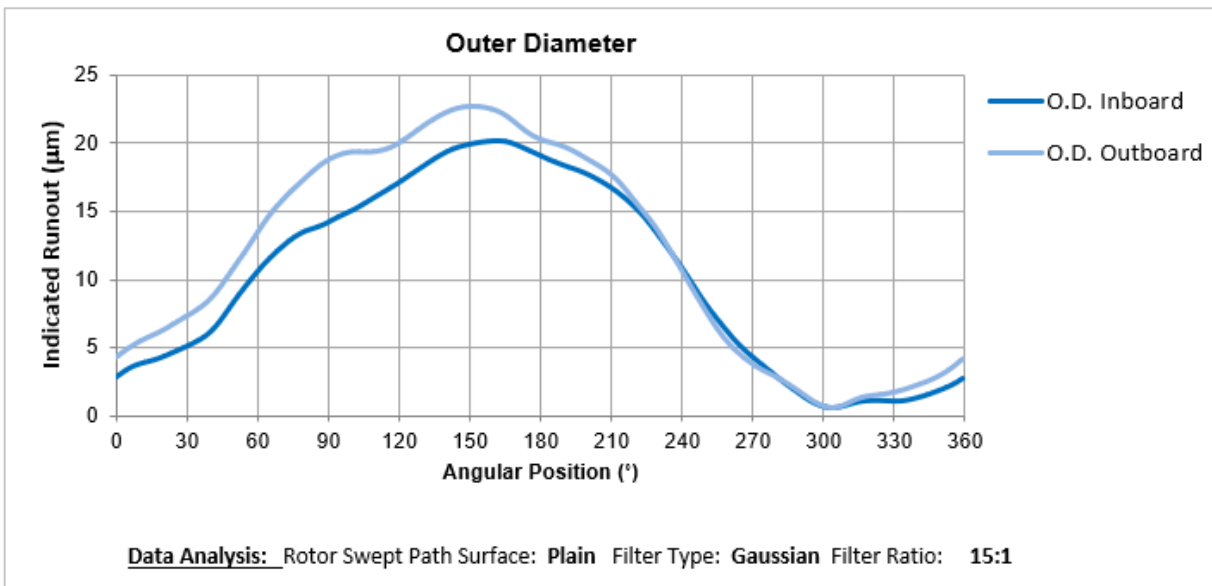


Figure 2 - Sample LRO plot

3.8 MEASUREMENT STAND

A system to perform a measurement independent of the test setup on the vehicle, dynamometer, or test rig.

3.9 MOUNTED LRO

The LRO value when mounted and torqued to the brake corner.

3.10 PORTABLE VEHICLE SYSTEM

A measurement system that is capable of measuring LRO, DTV, and drag. It is typically mounted on a cart to be portable and can be wheeled from hoist to hoist or to the dynamometer.

3.11 ROTOR HUB MOUNT FACE

A rotor surface that mounts against the brake corner hub (see Figure 3, with the arrow pointing to the hub mount face).

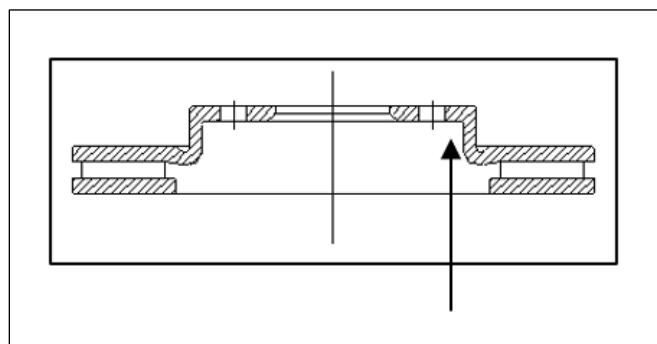


Figure 3 - Rotor hub mounting face location

3.12 ROTOR SWEEP PATH

The path the friction material contacts on the rotor when assembled on the knuckle.